

NOTICE RE: CERTIFICATES OF CORRECTION

DATE : 5/19/05

Paper No.: \_\_\_\_\_

TO : Supervisor, Art Unit 2127

SUBJECT : Certificate of Correction Request in Patent No.: 09/53,998  
4,868,440

A response to the following question is requested with respect to the accompanying request for a certificate of correction.

With respect to the change(s) requested, correcting Office and/or Applicant's errors, should the patent read as shown in the certificate of correction? No new matter should be introduced, nor should the scope or meaning of the claims be changed.

PLEASE COMPLETE THIS FORM AND  
RETURN WITH FILE, WITHIN 7 DAYS,

TO CERTIFICATES OF CORRECTION BRANCH - PK 3-915/922  
PALM LOCATION 7580 - TEL. NO. 305-8309

THANK YOU FOR YOUR ASSISTANCE!

Note your decision by placing a check mark in the appropriate box below, indicating whether all changes requested in the Request for Certificate of Correction should be applied. Please specify which changes should not be applied and indicate the reason(s) for denial, in the "Comments" section below.

☒ YES ☐ NO

☐ Comments: \_\_\_\_\_

C. Rones  
Supervisor

8 2164  
Art Unit

## UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

PATENT NO. : 6,868,414 B2  
DATED : Mar. 15, 2005  
INVENTOR(S) : Khanna, Sanjay et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 7,  
Line 29, change "the CD" to – the CS –;  
Line 57, change "research" to – re-search –.

Column 15,  
Line 1, change "modification" to – modifications –;  
Line 2, change "date" to – data –;  
Line 7, change "fist" to – first –;  
Line 45, change "preforming" to – performing –.

Column 16,  
Line 51, change "serializing the update tree" to  
– serialing a record describing the update to the update tree;  
switching the update tree –;  
Line 59, change "preformed" to – performed –.

MAILING ADDRESS OF SENDER:  
IBM Corporation / IP Law Dept.  
Dept. T81B/Bldg. 503  
P. O. Box 12195  
Research Triangle Park, NC 27709

PATENT NO. 6,868,414

No. of additional copies

⇒ Page 1 of 1

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



US00686414B2

(12) **United States Patent**  
**Khanna et al.**

(10) **Patent No.: US 6,868,414 B2**  
 (45) **Date of Patent: Mar. 15, 2005**

(54) **TECHNIQUE FOR SERIALIZING DATA  
 STRUCTURE UPDATES AND RETRIEVALS  
 WITHOUT REQUIRING SEARCHERS TO  
 USE LOCKS**

(75) **Inventors:** Sanjay Khanna, Cary, NC (US); Lori  
 Ann Napoll, Cary, NC (US)

(73) **Assignee:** International Business Machines  
 Corporation, Armonk, NY (US)

(\*) **Notice:** Subject to any disclaimer, the term of this  
 patent is extended or adjusted under 35  
 U.S.C. 154(b) by 231 days.

(21) **Appl. No.: 09/753,992**

(22) **Filed: Jun. 3, 2001**

(65) **Prior Publication Data**

US 2002/0087564 A1 Jul. 4, 2002

(51) **Int. Cl.<sup>7</sup> ..... G06F 17/30**

(52) **U.S. Cl. .... 707/3; 707/2; 707/8; 707/201**

(58) **Field of Search .... 707/2, 3, 8, 201**

(56) **References Cited**

#### U.S. PATENT DOCUMENTS

4,627,019 A	*	12/1986	Ng	707/8
5,497,487 A	*	3/1996	Fortier	707/8
5,852,715 A	*	12/1998	Raz et al.	709/201
6,006,216 A	*	12/1999	Griffin et al.	707/2
6,199,069 B1	*	3/2001	Dettinger et al.	707/202
6,353,820 B1	*	3/2002	Edwards et al.	707/2
6,360,219 B1	*	3/2002	Bretl et al.	707/8
6,377,959 B1	*	4/2002	Carlson	707/202
6,480,854 B1	*	11/2002	Gross et al.	707/10
6,535,869 B1	*	3/2003	Housel, III	707/2
2002/0004799 A1	*	1/2002	Gorelik et al.	707/201

#### OTHER PUBLICATIONS

"Serialization of AVL-Binary Tree Element Retrieval via Duplexed Pointers", Mar. 1992, IBM Technical Disclosure Bulletin, No. 10B, pp. 138-139.\*  
 IBM Technical Disclosure Bulletin, "Serialization of AVL Binary Tree Element Retrieval via Duplexed Pointers", Mar. 1992, pp. 138-139.

\* cited by examiner

*Primary Examiner*—Shahid Alam

*Assistant Examiner*—Chongshan Chen

(74) *Attorney, Agent, or Firm*—Marcia L. Doubet; Jerry W. Herndon

(57) **ABSTRACT**

The present invention provides a method, system, and computer program product for reliably and efficiently serializing access to data structures (i.e. updates and retrievals) without requiring searchers to use locks. The disclosed technique ensures that the contents of the data structure remain valid during access operations, yet does not require searchers to perform compute-intensive comparison operations to determine validity. Two trees are used at all times. Searches proceed against a first tree, while the second tree is used for performing updates. The steps required to carry out a particular update operation are stored as a queued transaction. When the update to the second tree completes, the trees are switched. The queued transaction is applied to the now-out-of-date tree, such that the nodes of this tree do not need to be searched or otherwise evaluated in order to perform the update, thereby optimizing the process of bringing this tree into synchronization with the tree that is now being used by the searchers. The two trees are repeatedly switched as additional update operations are performed. Atomic operations are used to ensure proper synchronization between the search and update processing on the trees.

19 Claims, 6 Drawing Sheets

